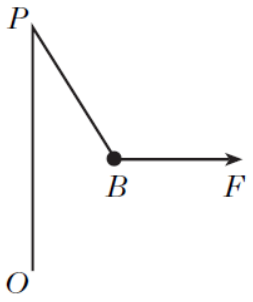
Forces in Equilibrium

2005

A1. A ball B of weight 9 newtons is attached to one end of a light inextensible string. The other end of the string is attached to P, the top of a fixed vertical pole OP.



By exerting a horizontal force of magnitude F newtons, the ball is held in equilibrium, with the string taut and $\angle OPB = 30°$.

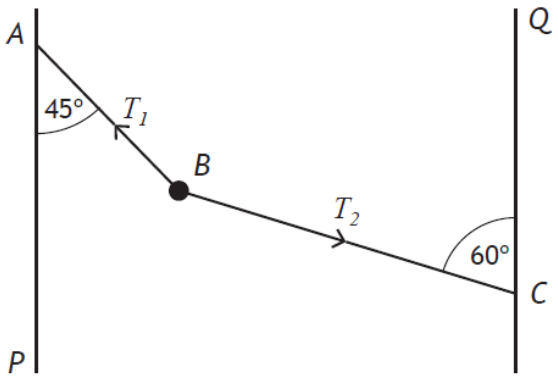
Calculate:

(a) the tension in the string; **2**

(b) the value of F. **2**

2016 EX

5. On a construction site, a 1000 kg concrete block is supported in equilibrium by two light inextensible cables *AB* and *BC*, attached to the block at *B*, as shown below.



PA and *CQ* are vertical with $\angle PAB = 45°$ and $\angle BCQ = 60°$. The tensions in the cables over sections *AB* and *BC* are denoted by T_1 and T_2 respectively.

(a) By resolving the forces horizontally, find a relationship between T_1 and T_2. **2**

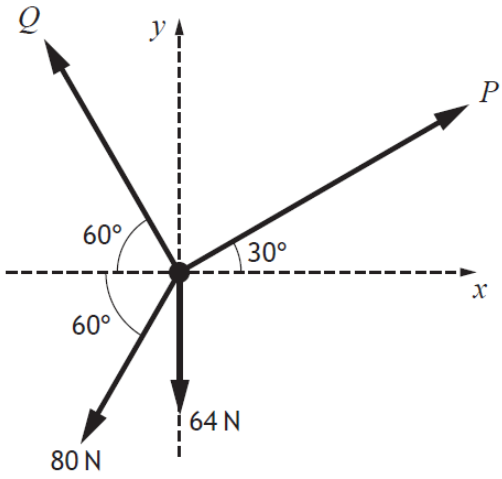
(b) Calculate the tension in T_2. **3**

2016

2. In a children's playground game, four light inextensible ropes are attached at one end to a small toy ring.

Four children each take the other end of a rope and pull it taut.

The ring is in equilibrium and the whole system is in a horizontal plane with appropriate axes as shown in the diagram.



The tensions in the four ropes are P, Q, 80 and 64 newtons respectively, and their directions relative to the axes are shown.

Calculate the magnitude of the tensions P and Q. **4**